DOMINANCE SHIFT OF PHYTOPLANKTON IN RELATION TO DIFFERENT ORGANIC FERTILIZER TREATMENTS IN CLARIAS GARIEPINUS CULTURE

BY [1]C. N. OSUJI; [2]J ALFRED-OCKYA
and [2]A. C. CHINDAH
[1]Ministry of Agriculture and Natural Resources, Fisheries/Livestock Division, Owerri, Imo State.
[2]River State University of Science and Technology, Port-Harcourt, River State

ABSTRACT

Dominance shift of phytoplankton in relation to different organic fertilizer treatments in Clarias gariepinus culture was studied in troughs for a period of seven months. Five doses (1000, 2500, 5000, 7500, 10000)kg/ha/six months of each organic fertilizer were applied biweekly. Euglenophyceae, Chlorophyceae, Cyanophyceae and |Bacillariophyceae were the plankton communities recorded with Bacillariophyceae dominating in cow (92%) and pig (77%) and chlorophyceae in chicken (93%) in the first month. The dominance shifted to Euglenophyceae and Chlorophyceae in all the three organic fertilizer by the second month and by the sixth and seventh month all were dominated by Cyanophyceae (blue green algae). With proper water quality management blue green algal bloom was controlled but with time as the water became richer in nutrients, due to accumulation of organic matter, the blue green algae became the dominant algae.

INTRODUCTION

Effective water management in fishponds is one of the important factors contributing to the success of fish culture. Proper water quality management reduces the occurrence of fish diseases and enhances fish growth and survival.

In fish culture ponds, fertilizers are added to pond water to increase nutrient concentrations necessary for phytoplankton growth. Addition of fertilizers would not only increase nutrient concentrations, but also affect directly or indirectly other aspects of pond environment. It is important to understand the dominance shift of phytoplankton as a result of organic fertilization in order to develop appropriate management procedures. The study describes the dominance shift of phytoplankton in relation to different organic fertilizer treatment.

MATERIALS AND METHODS

The experiment was conducted in sixty (60) troughs of dimension 0.5m depth, 0.5m diameter and a volume of 60 litres for a period of seven months. Three different organic fertilizers (chicken droppings, pig dung and cow dung) were used. There were five doses of each organic fertilizer. The troughs were randomly placed.

All troughs were filled with 5cm layer of river sand and limed with 500kg/ha as recommended by Viveen et al. (1984) for a pH that is less than 6.5. The troughs were filled with (30) litres of water and allowed to stand for four days to stabilize. Five different doses (1000kg/ha, 2500kg/ha, 5000kg/ha, 7500kg/ha and 10000kg/ha) of the organic fertilizers were added

to the respective troughs at biweekly interval over a period of six months at the following rates 83.3kg/ha, 208.3kg/ha, 416.6kg/ha, 625kg/ha and 833.3kg/ha. Fresh manure was thoroughly dissolved in water before adding to the troughs.

The water was aerated as much as possible by stirring the water twice daily. To maintain the desired water level through out the experimental period, water was replenished as was required.

The quality of the phytoplankton was determined by identifying the organisms with suitable keys and monographs (Needam, 1974; Palmer, 1962; Pontin, 1978 Barber and Harwoth, 1994).

RESULTS AND DISCUSSION

The abundance of phytoplankton by taxonomic division is shown in fig 1. In the first month in cow and pig manure treated waters it is dominated by Bacillariophyceae (92% and 77%) respectively and by Chlorophyceae (93%) in chicken manure treated water. The dominance shifted to Euglenophyceae and Chlorophyceae in the second month in all three manure treated waters. By the third month Euglenophyceae and Cyanophyceae dominated chicken and pig manure. All three manure treated water got dominated by Cyanophyceae by the sixth and seventh month (Fig 2). The dominance by Bacillariophyceae in the first month and in cow manure was expected because nutrient level was low at the time in the cow and pig manure treated waters. Bacillariophyceae has been reported to be dominant in waters having low nutrient levels (Dhawan and Toor, 1989). Cow manure has been reported by Rappaport and Sarig (1978) to be inferior to other farm animal manure such as chicken droppings, duck manure and swine waste due to its high digestive efficiency. Chicken manure on the contrary, maintained a level of nutrient that allowed the dominance of Euglenophyceae because of its poor particulate matter that allows fast release of nutrients into the water body. As the nutrient level increased phytoplankton dominance generally shifted to green algae and as the water got richer with organic load blue greens became the dominant algae. Other researchers have also reported the development of cyanobacterial bloom to be favoured under conditions of high nutrient loading (Akpan and Okafor, 1997; Paerl and Tucker, 1995). Bloom forming aquaculture cyanobacteria are undesirable to aquaculture ponds because: 1) they are a relatively poor base for aquatic food chain; 2) they are poor oxygenators of the water and undesirable growth habits; 3) some species produce odorous metabolites and impart undesirable flavours to the cultured animal; 4) some species produce compounds that are toxic to aquatic animals. With the use of organic fertilizer as primary nutrient source, long culture periods should be avoided to minimize the dominance shift to blue green algae.

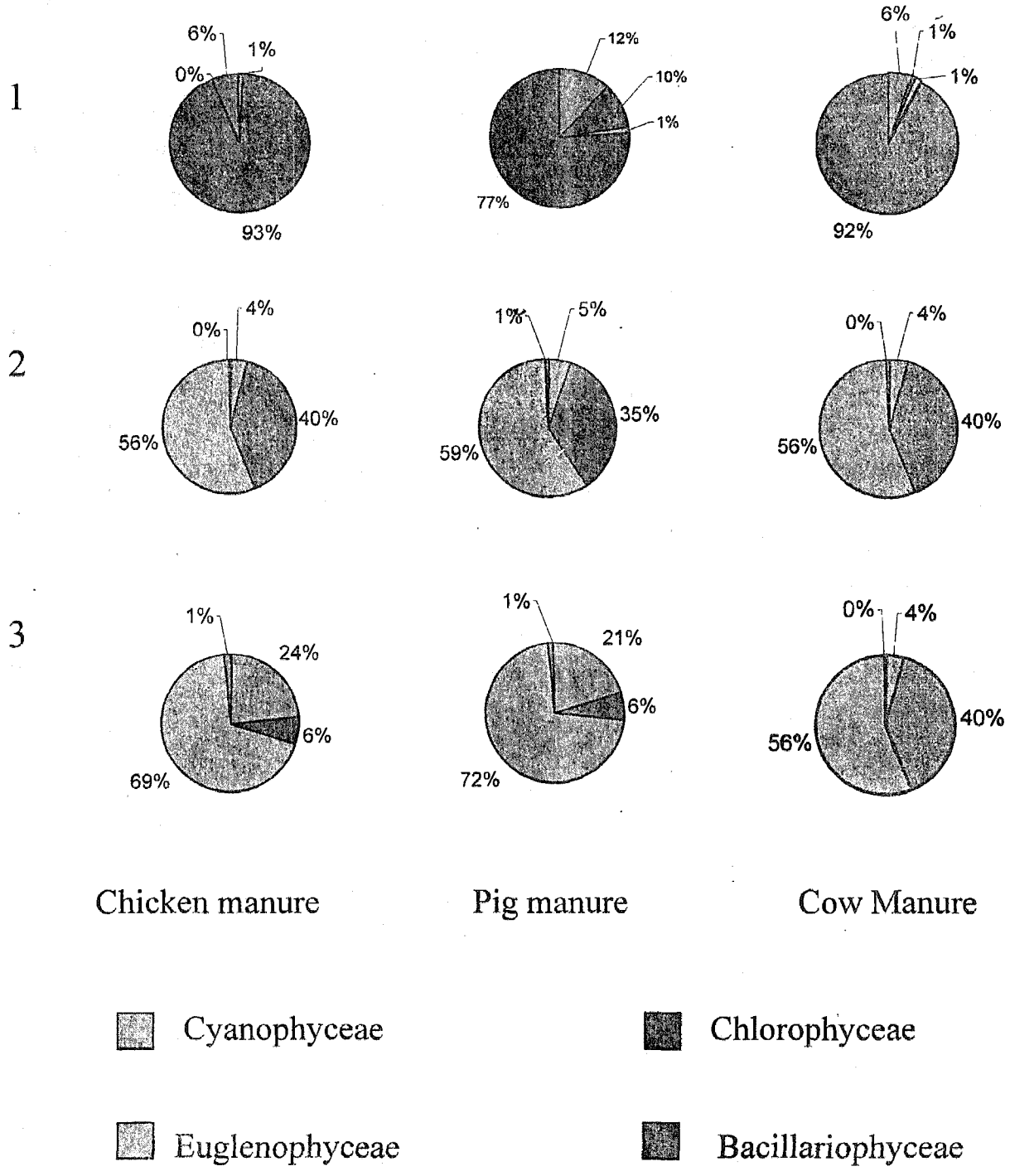

Fig 1: Phytoplankton abundance by taxonomic division in three different manure-treated waters

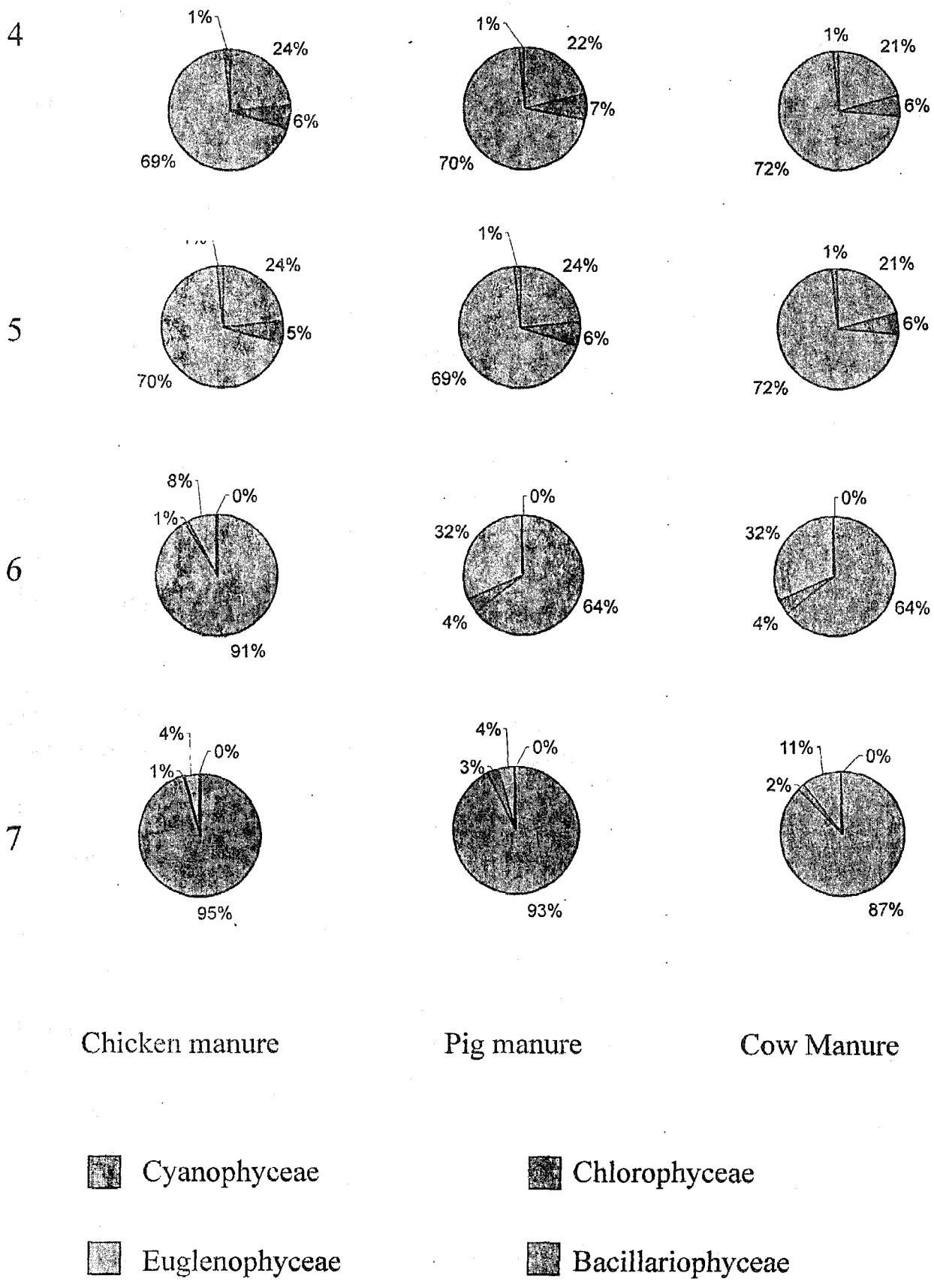

Fig 2: Phytoplankton abundance by taxonomic division in three different manure-treated waters

REFERENCES

Akpan, E. R. and Okafor, N. (1997). On organic fertilization and plankton development in two experiemental freshwater ponds of Nigeria. *J. Aqua. Trop.*, 12: 147 - 154.

Anadu, D. I. and Ebeonwu, B. I. N. (1994). Application of liquid manure in common carp production. *Aquaculture Magazine*, 20 (3): 56-62.

Dhawan, A. and Toor S.H. (1989). Impact of organic manures or supplementary diet on plankton production and growth and fecundity of an Indian major carp, *Cirrhina mrigala* (Ham), in fish ponds. *Biological wastes*, 29: 289 297

Needham, J. G. (1974). A guide to the study of fresh-water biology. 5th edition. 108pp. Holden-Day, Inc., San Francisco.

Onuoha, G. C., Chinda, A., Oladosun, G. A. and Ayinla, O. A. (1991). Effect of organic fertilization on pond productivity and water quality of fish ponds at Aluu, Nigeria. Nigerian Inst. For Oceanog. And Marine Res. Lagos. *Technical paper* No. 74: 1-12.

Paerl, H. W. and Tucker, C. S. (1995). Ecology of blue green algae in aquaculture ponds. *Journal of the World Aquaculture Society* Vol. 26, 2: 109 131

Palmer, C. M. (1962). Algae in water supplies: An illustrated manual on the identification, significance and control of algae in water supplies. 87 pp. U.S. Department of Health, Education and Welfare Public Health Service, Washington 25, D. C.

Rappaport, U. and Sarig, S. (1978). The results of manuring on intensive growth fish farming at the Ginosar station ponds in 1977. *Bamidgeh*, 30: 27-36

Viveen, W.J.A.R., Ritcher, C.J.J., Van-Oodit, P.G.W.J., Jenseen, J.A.L and Hussan, E.A (1984). Practical manual for the culture of the African catfish clarias gariepinus. Joint publication of Directorate General International Cooperation of the Mnisty of Foreign Affairs, the Hague, the Netherlands, Department of fish culture and Fisheries of the Agricultural University of Wageningen, the Netherlands and Research group for Comparative Endocrinogy, Department of Zoology of the University of Wrecht, the Netherlands.